

EVIDENCE FOR A THIRTY DEGREE OFFSET BETWEEN THE HELIOSPHERIC UPSTREAM DIRECTION AND THE PEAK NEUTRAL FLUX INSIDE OF 1 AU

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The annual modulation of solar wind energetic neutral atom flux at the Earth observed by the Low Energy Neutral Atom Imager on the IMAGE spacecraft reveals a pronounced variation of the neutral gas column density between the Sun and the Earth with season. This modulation is evidently dominated by interstellar neutral gas and the solar erosion of that gas in the galactic downstream region. It also contains a relatively constant contribution from inner solar system dust and relatively smaller variations produced by solar wind fluctuations and possibly structure in the dust population. Interestingly, there appears to be about a 30 degree shift between the upstream direction, the position of the Earth in early June, and the peak of the solar wind neutral flux. This shift may be apparent in other data sets, as well, including the IMAGE/MENA data and the LENA direct interstellar neutral observations, and indicates that there may be an asymmetry in the heliosphere with respect to the upstream direction.